DOCUMENT RESUME

ED 307 367 UD 026 791

AUTHOR Reynolds, Arthur J.
TITLE A Structural Model of First-Grade Outcomes for an Urban, Low Socioeconomic Black Population.
PUB DATE Apr 89
NOTE 29p.; Paper presented in a symposium at the Annual Meeting of the American Educational Research Association (San Francisco, CA, April 27-31, 1989).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Blacks; *Educational Attainment; *Grade 1; Hispanic Americans; Kindergarten; *Kindergarten Children; Low Income; *Minority Group Children; Models; Outcomes of Education; Parent Influence; Path Analysis; *Predictor Variables; Primary Education; *Readiness; Urban Education
IDENTIFIERS *Psychosocial Factors

ABSTRACT

This study tested an integrative longitudinal model of the early schooling process on three first-grade outcomes for 1,539 poor urban ethnic minority children (1,470 Black; 69 Hispanic). The model views educational attainment as a function of readiness characteristics upon entry into kindergarten and intervening kindergarten and first-grade social-psychological variables. A block recursive path analysis was used to test the model. Major findings were that cognitive readiness resulting from kindergarten experience had pervasive indirect effects on all first-grade outcomes, and intervening variables of motivation, peers, parent involvement, and mobility had significant direct and/or indirect effects on the attainment process. These latter variables are directly under the influence of families and schools. The links in the attainment and motivational patterns are still forming. The stability of results needs to be monitored carefully. Four illustrations and one table of statistical data are included. A list of 56 references is appended. (FMW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

5-16-89

ED307367

A Structural Model of First-Grade Outcomes for an Urban, Low Socioeconomic Black Population

Arthur J. Reynolds

University of Illinois, Chicago

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Arthur J Reynolds
Univ of IL, Chicago

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Running head: FIRST-GRADE OUTCOMES

Paper presented in a symposium at the Annual Meeting of the American Educational Research Association, April 27-31, 1989, San Francisco, CA.

UD 026 791

BEST COPY AVAILABLE

Abstract

This study tested an integrative longitudinal model of the early schooling process on three first-grade outcomes for 1539 ethnic minority children (*n* = 1470, Black; *n* = 69, Hispanic). Estimation of the model showed that entering kindergarten cognitive readiness had pervasive indirect effects on all first-grade outcomes and that the intervening variables of motivation, peers, parent involvement, and mobility had significant direct and/or indirect effects on the attainment process. Equally important is that these latter variables are directly under the influence of families and schools. The links in the attainment process appear particularly amenable to intervention during kindergarten when school attainment and motivational patterns are still forming. The stability of results needs to be monitored carefully.

A Structural Model of First-Grade Outcomes for an Urban, Low Socioeconomic Black Population

The renewed focus of research on young children has enhanced the drive to understand the early schooling process and the determinants of schooling outcomes. Although considerable progress has been made, relatively little is known about the schooling process of low income children. Yet, in a time when the number of families living in poverty and the number of public school students coming from low status backgrounds is increasing (Comer, 1988; Orfield, 1988), models investigating the multifarious influences on attainment are essential. How do at risk children adapt to school? What variables influence this process? In what ways can this transition be enhanced? These questions focus on the whole context of learning.

Followup studies of Head Start provide a glimpse of the determinants of early schooling outcomes for low income or at risk children. While a number of variables have been identified, including prekindergarten experience (Lazar & Darlington, 1982; Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1985), school context (Carter, 1984; Cooley & Lohnes, 1976; Stallings & Kaskowitz, 1974), teacher perceptions (Tizard, Blatchford, Burke, Farquhar, & Plewis, 1988), and student background characteristics (Carter, 1984; Cline, Endahl, & McBee, 1980), comprehensive explanatory models of the early schooling process remain noticeably absent. This is probably due to the fact these studies were not specifically designed to provide such models.

Entwisle and Hayduk (1982) conducted one of the first revealing prospective studies of the early schooling process for a diverse sample of urban children in grades one to three. Positing that end of term grades in reading, math, and conduct were a function of subject area expectations (parent and student), prior subject area grades, parent's ability estimate of child, peer popularity, absences, and race, they found considerable differences in the early schooling process among White middle class, integrated lower class, and Black lower class students.

Later studies by Entwisle and colleagues have further expanded on this model, finding, among other things, that the effects of achievement over time are linked to social resources of the school (i.e., teacher expectations, parent ability estimates of children) (Entwisle & Hayduk, 1988) and that the sources of early achievement differ in number and magnitude among Black and White students (Alexander & Entwisle, 1988; Entwisle & Alexander, 1988). These results led Alexander and Entwisle to conclude that "black students will find it more difficult than white youngsters to recover from a shaky start. In this sense, the transition to full-time schooling is both more important and more problematic for minority youngsters" (p. 111).

While these studies direct attention to the attainment of at risk students, they also raise three general issues

about models of the early schooling process. One is conceptual. The Entwisle and Hayduk (1982) model as well as more recent frameworks (Entwisle & Hayduk, 1988; Alexander & Entwisle, 1988), relying on a status attainment (i.e., socialization) model, does not consider the full range of variables that influence outcomes. For example, school learning models give particular relevance to psychological attributes of the learner including home environment, motivation, peers, quality of instruction, and the educational climate (Carroll, 1963; Bloom, 1976; Walberg, 1984). These kinds of proximal variables appear particularly relevant for low income students because they are susceptible to change by families and schools. Haller (1982) recognized this unexplored area in the status attainment field when he advocated a "new wave" of research that would explore unexamined proximal and social psychological variables.

A second issue is related to the process of schooling. Schooling or attainment denotes both the direct and more subtle indirect effects that operate to influence outcomes. These effects have been clearly recognized in research on educational attainment (Keith, Reimers, Fehrmann, Pottebaum, & Aubey, 1986; Hoffman, 1984; Kerckhoff, 1976), but, with one exception (Cline, Endahl, & McBee, 1980), have not been tested in early schooling models. For example, socioeconomic status may not only have a direct effect on later achievement, but also an indirect effect through its supposed influence on intervening variables (i.e., home environment, aspirations, and intervening achievement). Other attributes of the child (i.e., prekindergarten experience, prior achievement) may also be mediated by other variables.

A third issue is methodological. Most longitudinal research on the determinants of schooling outcomes employ either cross-sectional or two-wave designs. There is increasing evidence that such designs are inadequate to investigate dynamic process models over time such as educational attainment (Rogosa, 1979; Kessler & Greenberg, 1981). Three-wave designs and above are often suggested to study longitudinal change, yet are seldom used.

In light of these issues the present study tests an early schooling process model of first-grade outcomes for an urban, low income Black population.

A Model of First-Grade Outcomes

Figure 1 displays a model of first-grade outcomes. It views educational attainment as a function of readiness characteristics upon entry into kindergarten and intervening kindergarten and first-grade social psychological variables. The model is a synthesis of traditional theories of school learning (Carroll, 1963; Bloom, 1976), Walberg's (1984, 1986) productivity model and recent research findings with low income children. As indicated above, these models explicitly include variables that have not been fully considered in studying the early schooling process.

Insert Figure 1 about here

As displayed in Figure 1, readiness characteristics including cognitive readiness (ENTER-K), socioeconomic status (SES), sex, and prekindergarten experience (PREK) describe the history of the learner that may influence early success in school (Carroll, 1963; Bloom, 1976). Cognitive readiness and sex have been a prevalent focus of research and theory on learning (Keeves, 1986, Walberg, 1984). The inclusion of prekindergarten experience is based on a wealth of consistent findings of short-term positive effects for low income populations, although its influence fades over time (Bronfenbrenner, 1975; Lazar & Darlington, 1982; White, 1985-1986). Socioeconomic status is used as a measure of social context. While low income children are not expected to differ in family background, the economic context of where they live may direct his/her later beliefs and behaviors (Blau, 1981; Cooper & Tom, 1984).

Intervening variables in kindergarten, motivation and peer influence, tap both the internal press of the individual toward learning and the external climate of the school surrounding the child. Achievement motivation, particularly, has a rich history in educational psychology and school learning (Carroll, 1963; McClelland, 1976), in that it characterizes an individual's persistence to succeed. Both are consistent with educational productivity models (Walberg, 1984) and are expected to have indirect effects on attainments. Reading (READ-K) and math (MATH-K) achievement at the end of kindergarten represent year-end cognitive status, which, in turn, act as direct influences on intervening first-grade measures and first-grade outcomes. However, READ-K is not hypothesized to predict first-grade math achievement nor is MATH-K expected to influence first-grade reading achievement.

Parent involvement in school activities and mobility after kindergarten are intervening first-grade variables that are influenced to some degree by all prior variables. Parent involvement has seldom been used in structural models of the attainment process but has been related to student achievement (Chicago Public Schools, 1987a; Stevenson & Baker, 1987). It also provides a behavioral rather than ascriptive measure of the influence of parents. Student mobility (i.e., whether a child stays in his/her current school after kindergarten) may be an important source of continuity during the early schooling process, especially for low income students (Kellam, Branch, Agrawal, & Engsminger, 1975). These intervening variables then influence first-grade outcomes in reading (READ-1), math (MATH-1), and socio-emotional maturity (SEMAT-1).

As implied by the paths in the model, variables have indirect as well as direct effects over time. For example, entering kindergarten achievement is posited to have a direct

influence on motivation but also a indirect effect on end of kindergarten achievement through its influence on motivation. Prekindergarten experience may not only have a direct effect on first-grade attainment but may also influence intervening variables (i.e., kindergarten achievement, parent involvement) that in turn affect first-grade scores (Hoffman, 1984; Berrueta-Clement et al., 1985). Because early schooling process models are in the preliminary stages, nearly all paths implied by the model will be estimated initially. Peer influence is expected to influence first grade attainment only indirectly.

Another primary feature of the model is the inclusion of variables that can be altered in an educational context. This will be of particular concern in the study as it is a continuing focus of research (Haertel, Walberg, & Weinstein, 1983; Laosa, 1982; Valencia, Henderson, & Rankin, 1985).

The model is based on time precedence, theory, and related research. It is also consistent with other interpretations (Keeves, 1986; Maruyama & Walberg, 1984). For example, READ-K and MATH-K are posited to influence parent involvement rather than the reverse because parent involvement was measured in grade 1 when it was no longer required (as in kindergarten), thus, parents would be likely to become involved as a result of their children's prior achievement. In addition, the blocking of intervening and outcome variables is the result of inconclusive evidence that causal direction among variables can be assigned within each block (i.e., achievement and maturity) (Entwisle, Alexander, Cadigan, & Pallas, 1987).

I expect intervening variables, particularly, motivation to have direct and indirect effects (through achievement) on first-grade outcomes. I also expect both parent involvement and mobility to have direct effects on outcomes. I further anticipate that readiness characteristics, especially, entering kindergarten cognitive readiness, will have substantial indirect effects through prior achievements on first-grade outcomes. Although it is not a focus of the study, I expect kindergarten achievement will have the greatest impact on first-grade attainments.

The model differs from other models of attainment by (1) the inclusion of relatively unexplored variables (i.e., PREK, mobility, parent involvement) that are relevant to low income students, (2) the explicit testing of the indirect effects of readiness and intervening variables over time, and (3) the study's two-year panel design. Such integrative frameworks are also more consistent with the dynamic nature of attainment (Alwin & Thornton, 1984; Marjoribanks, 1987; Mercy & Steelman, 1987).

This study conducts an empirical test of the model. It focuses on two general questions: (1) What are the effects (indirect and direct) of intervening variables on first-grade outcomes, most particularly motivation, parent involvement, and mobility and (2) Do readiness characteristics have meaningful indirect effects on first-grade outcomes?

Design and Sample

A three-wave longitudinal design was used to test the model, spanning from fall 1985 to spring 1987. Information was collected both retrospectively from student records and prospectively from teacher questionnaires and test files. A representative sample of 1539 children (n = 1470, Black; n = 69, Hispanic) in government funded kindergarten programs (26 schools) of a large urban school district was selected in spring 1986 for followup into the primary grades. Eligibility for these programs is limited to schools which serve a large proportion of economically disadvantaged students. Parent survey responses indicated that 94% of children were eligible for lunch subsidies.

The first wave of data consisted of readiness attributes and was collected from student records on file in 1985. These data included prekindergarten experience, socioeconomic status, sex, and entering cognitive readiness. The second wave was collected in spring 1986, when schools of children were sent questionnaires seeking teacher evaluation of childrens' progress in kindergarten (i.e., motivation, readiness for first-grade). Concurrent, end-of-kindergarten test scores were also obtained. The third wave was collected during first-grade in spring 1987 and included first-grade test scores and teacher questionnaire responses assessing student progress, maturity, and parent involvement.

At the end of grade 1, 1359 (88%) children remained in the school system. The other 12% most likely transferred out of the public school system before the end of first-grade. This remaining group was representative of the total sample, as there were no consistent differences on entering kindergarten characteristics (entering cognitive readiness, sex, school socioeconomic status, and preschool experience).

Variables

As displayed in Figure 1, the model is divided into three broad categories: (1) school readiness attributes, (2) intervening kindergarten and first-grade affective and cognitive characteristics, and (3) first-grade outcomes. They are described as follows.

Entering Kindergarten Cognitive Readiness (ENTER-K). Comprehensive grade equivalent (GE) scores on the fall 1985 Iowa Tests of Basic Skills (ITBS) (Level 5 Form 7) was used as a measure of entering school readiness (Hieronymus, Lindquist, & Hoover, 1980a). As with other achievement measures below, scores are reported in GE years.

Socioeconomic Status (SES). This socioeconomic context variable was defined as the percent of low income families within a school's geographical area (Chicago Public Schools, 1987b). It was collected in the spring of 1986 and applies to a child's kindergarten school. Values ranged from 40 to 80% and confirm the diverse context in which the children live. To be consistent with research, the directionality of

the variable was reversed for data analysis by subtracting values from 100%.

Sex. Sex was coded 1 for boys and 2 for girls.

Prekindergarten experience (PREK). Students who had no prekindergarten experience were coded 0. Those with any experience (e.g., Head Start or Child Parent Center) were coded 1. This information was obtained directly from computerized student records. Prekindergarten status was affirmed if students were documented as being enrolled in prekindergarten from fall 1983 to spring 1985. Children who were not on file were assumed to have not participated in prekindergarten.

Motivation. In the spring of kindergarten (1986), teachers assessed various student characteristics. Three items were most related to student achievement motivation or the ability to persist in academic tasks: (1) Likes numbers work, (2) Likes reading activities, and (3) Is eager to learn. Each item was rated on a 7-point Likert scale from always (7), to never (1), and, together, had an alpha reliability of .94. Other variables, such as "tries hard" and "concentrates on work," were also empirically tested but did not improve the reliability or alter the scale's relationship with other variables thus were dropped.

Peer Influence (Peer). This measure was a cognitive indicator of the influence of other children in a child's kindergarten program. It was a school level measure of scores on the ITBS composite battery in spring 1986 (Hieronymus et al., 1980a).

Spring kindergarten reading (READ-K) and math achievement (MATH-K). End-of-kindergarten learning in reading and math was based on the spring 1986 ITBS (Level 5 Form 7) (Hieronymus et al., 1980a). The reading subtest is formally called "word analysis" but will be referred to as reading for convenience and consistency.

Parent Involvement. Toward the end of first-grade, teachers assessed the amount of parent involvement in school activities on a single item "parent's participation in school". Responses ranged from poor, not at all (1) to excellent, much (5). While teacher reports may not be completely representative of parent involvement in school, the focus on the general school relations is clearly an area which a teacher would be expected to know. The measure is also similar to that of Stevenson and Baker (1987).

Mobility. This information was coded 0 if a student remained in his kindergarten school during first-grade and 1 if he/she went to another city school. Students leaving the school system were not tracked.

Grade 1 reading achievement (READ-1) and math achievement (MATH-1). Spring 1987 ITBS reading comprehension and math total subtest scores (Level 6 or Level 7 Form 7) were used as measures of cognitive achievement (Hieronymus et al., 1980b).

Grade 1 socio-emotional maturity (SEMAT-1). In the spring of 1987, teachers completed a 14-item assessment scale coded on a Likert-type scale from poor or not at all (1) to excellent or much (5). Six items defined socio-emotional

maturity:

1. Came to my class ready to learn 2. Completes work according to instructions 3. Complies with classroom rules 4. Displays confidence in approaching learning tasks 5. Works and plays well with others 6. Participates in group discussions.

The summed scale was coded so that higher scores represented greater levels of readiness. The scale had an alpha reliability of .92. It was also similar in substance to Entwisle et al. (1987) personal maturity measure.

Data Analysis

A block recursive path analysis was used to test the proposed model. The model was estimated by maximum likelihood through the program Linear Structural Relations analysis (LISREL VII) (Joreskog & Sorbom, 1988). Path analysis is useful for decomposing effects in a structural system with the goal of establishing "weak" causal ordering (Marascuilo & Levin, 1983). Maximum likelihood estimation yields optimal parameter estimates with relatively large samples (i.e., $n > 1000$) (Cuttance, 1987).

Specifically, a manifest variables structural equation model with correlated errors will be used. This analysis differs from ordinary least squares (as implemented by general purpose programs such as SPSSX and SAS) in three major ways. First, the model is estimated as a complete system (full information model) rather than as a series of multiple regression equations. Second, LISREL has the ability to take account of autocorrelation among residual errors within and between prediction equations. Correlated errors are a consistent problem in panel models, especially dynamic models with lagged endogenous variables (Hannon & Young, 1977; Hibbs, 1974; Kessler & Greenberg, 1981). Third, the fit of the model can be evaluated statistically through a chi-square test. Ordinary least squares estimation has been increasingly viewed as inadequate for estimating structural models (Bentler, 1980; Hibbs, 1974; Kenny, 1979; Rogosa, 1979). The model was estimated for the total group only as there were no consistent interaction effects on sex. The analyzed model was based on an imputed data matrix using pairwise deletion of missing data (Min. pairwise $N = 866$, mean pairwise $N = 1259$).

Results

Standardized maximum likelihood estimates for the model are displayed in Figures 1 thru 3. The final model had an exceptionally good fit with the data $X^2(11, \text{mean } n = 1259) = 8.81$, $p < .787$; goodness of fit index = .999. In addition, variances explained by the model were impressive, especially given that the figures are adjusted for correlation among prediction errors across equations (READ-1, 45%; MATH-1, 39%; and SEMAT-1, 36%). A more detailed examination will be

presented separately for each outcome. Only the most notable results will be presented for the direct effects on intervening variables.

Effects on Reading Achievement

Direct effects. As shown in Figure 1, four of the nine predictor variables had significant ($T > 2.5$ or $p < .01$) direct effects on first-grade reading achievement. Two were readiness characteristics, entering kindergarten readiness (ENTER-K) and sex (in favor of girls) and two were intervening variables, kindergarten reading achievement (READ-K) and parent involvement in school activities. Motivation ($b = .061$) and mobility ($b = -.043$) had smaller effects ($p < .05$). While the effects of READ-K are by far the greatest ($b = .472$), the moderately strong effect of parent involvement clearly indicates the positive influence of parent contact with schools. ENTER-K also had a strong influence on READ-1, highlighting the importance of academic readiness upon school entry.

Although the direct effects of SES and motivation on READ-1 were negligible, their effects on intervening variables were considerable. SES directly influenced all intervening variables, although not strongly. Motivation had a significant positive influence on READ-K, mobility, and parent involvement. The effects of PREK were specific to peers and parent involvement.

Indirect effects. Indirect effects on first-grade outcomes are summarized in Table 1. They are products (or sums of products) of direct effects that indicate the influence of a predictor variable on an outcome variable through intervening variables. The intervening variables that produced the indirect effects are shown in the diagram for each particular outcome. Quite strikingly, the indirect effects of readiness characteristics played a primary role in influencing READ-1. ENTER-K, by far, exerted the greatest indirect effect ($b = .316$) on READ-1. Particularly strong was its indirect effect on READ-1 through READ-K ($b = .195$ or $.414 * .472$). Smaller but notable effects were also found through motivation and READ-K ($b = .038$ or $.269 * .298 * 472$) and motivation ($b = .016$ or $.269 * .061$). Other intervening variables having significant indirect effects included motivation, SES, peers, PREK, and sex. For example, the primary indirect effects of motivation passed through READ-K ($b = .141$ or $.298 * .472$) and parent involvement ($b = .024$ or $.099 * .238$). READ-K was a principal source through which variables exerted their effects.

Effects on Math Achievement

Direct effects. As shown in Figure 2, the process of attainment in math was very similar to that of reading. Note that the influences on nonachievement variables are identical to Figure 1. This is due to the model being estimated as a full information system. Primary differences were the additional paths of motivation and mobility. Motivation had

a positive effect on math learning, whereas mobility (changing schools after kindergarten) had a negative influence. In addition, both prior achievement and sex were less influential on math learning. The lower explanatory power of the model was probably due to the lower effect of prior achievement.

Indirect effects. As shown in Table 1, the indirect effects on MATH-1, although slightly lower, were very similar to READ-1. Again, ENTER-K had a pervasive influence (b = .287), most of which is accounted for through MATH-K (b = .158). Over one-half of the indirect effect of motivation passed through MATH-K (b = .086) and parent involvement (b = .022). MATH-K was also the source of peers effect (b= .088) on READ-1. Parent involvement mediated the effects of SES, sex, and PREK.

Effects on Socioemotional Maturity

Direct effects. As displayed in Figure 3, the model for socio-emotional maturity (SEMAT-1) was more circuitous than the other two outcomes, due to the inclusion of both READ-K and MATH-K as predictors. Seven variables had direct effects on SEMAT-1, although none stood out. Parent involvement had the greatest direct effect (b = .301), followed by sex (b = .224), motivation (b = .146), and MATH-K (b = .145). The effect of mobility was the reverse of its influence on READ-1 and MATH-1, indicating that children who leave their kindergarten schools are lower achieving but more mature. The greater effect of sex on maturity was not surprising, as girls were rated higher by their teachers than boys.

Indirect effects. The indirect effects were generally lower, due to the lower predictive power of achievement variables. Readiness and intervening variables maintained their significant indirect effects, including ENTER-K (b = .208), motivation (b = .094), and SES (b = .084). MATH-K, READ-K, and parent involvement were primary sources of effects. The effects of ENTER-K were exerted primarily through end-of-kindergarten achievement. The effects of SES and PREK passed through parent involvement. Both parent involvement and kindergarten achievement mediated some the effects of motivation. More so than achievement, maturity appears to be an amalgaman of indirect effects throughout the early schooling process.

In summary, the pattern of results was similar across the three outcomes. For the most part, readiness characteristics influenced first-grade attainment indirectly through kindergarten attributes, especially, end of kindergarten achievement and motivation. With the exception of peers, all intervening variables had direct effects on first-grade outcomes. Particularly notable were the direct effects of motivation, parent involvement, and mobility on attainment and the indirect effects of entering achievement.

Discussion

The purpose of this study was to test a model of the influences of social and cognitive factors on three first-grade outcomes for an urban, low income Black population. Results lay testament to the truly multifarious influences on cognitive and affective attainment. The early schooling process is a complex network of effects, in which many variables contribute. A number of variables had direct and indirect effects on schooling outcomes: ENTER-K, end-of-kindergarten achievement, motivation, mobility, and parent involvement. These diverse influences signal that the early period of schooling is a time of rapid adaptational and psychological changes that can either be positive and growth enhancing or negative, in which case school success is more difficult to attain.

The pervasive effects of cognitive readiness (ENTER-K), although expected, were larger than anticipated. The indirect effects of ENTER-K on first-grade outcomes were greater than its direct effects. In fact, its total effect on READ-1 and MATH-1 were greater than the direct effects of prior achievement. The source of these effects derived primarily from paths through motivation, end-of-kindergarten achievement, and to a lessor extent, parent involvement. These powerful effects suggest the critical importance of kindergarten readiness for future school success among low income students. This finding clearly directs attention to the time before kindergarten as very important in preparing a child for the schooling process. The continued direct effect of ENTER-K through first-grade indicates the difficulty children face in overcoming their entering cognitive status. This may be the result of their at risk status.

However, once the schooling process is under way a number of educationally alterable variables are instrumental in first-grade attainment. Motivation is a particularly strong link for all three outcomes in three ways. It is a mediator of the effects of readiness characteristics (ENTER-K, SES, and sex). It has indirect effects on attainment through prior achievement, mobility, and parent involvement. The direct effect of motivation on MATH-1 and SEMAT-1 was also significant. Although the role of motivation is expected to be greater as children become older (Stipek, 1984), present findings indicate it is a crucial link in the early schooling process. Unfortunately, it is not often used with young children. These findings further support school learning models incorportating motivation (Carroll, 1963; Walberg, 1984).

Mobility is another alterable influence on first-grade attainments. Children who remained in their kindergarten school during first-grade learned more in reading and math than those who changed schools. This finding is consistent with Kellam et al., (1975), who found that mobility was one source of lower achievement and social maladaption in first-grade children. Quite understandably, children who move to another school have to adjust to a different school environment, new friends, and new teachers. Although the

nature of mobility is not well understood, readiness characteristics and motivation may play a primary role.

However, the positive effect of mobility on SEMAT-1 was surprising, and suggests that mobility may lead to higher maturity over time. One explanation could be that teachers of mobile children were more optimistic than other teachers about their childrens' maturity. First-grade teachers of stable students, because they have known their children longer may have expected more from them, thus, were more critical in their evaluations.

Parent involvement in school activities is a further influential variable that is educationally alterable. It had a consistent positive influence on READ-1, MATH-1, and SEMAT-1. This finding is consistent with other studies (Stevenson & Baker, 1987; Iverson, Brownlee, & Walberg, 1981), and highlights the strong family-school link in the early schooling process. Of futher note was that parent involvement mediated the effect of motivation on first-grade outcomes. Thus, parent involvement is also important in maintaining the effect of motivation on early school success.

The findings have similar patterns to those of other studies. For example, Alexander and Entwisle (1988) found school-related variables to be more important for Black children. The relevance of peers, parent involvement in school activities, and mobility in early attainment bear this out. The strong indirect effects of readiness attributes are also similar to compensatory education research (Carter, 1984), although the magnitude of effects in the present study was stronger. The importance of school-related variables is also supported by research on socialization (Blau, 1981; Clark, 1983).

However, the present findings show rather explicitly that the links in the early schooling process form very early (during kindergarten) and are both student-centered and school-based. Readiness for kindergarten and motivation, especially, are very influential links in early adaption to school and they continued to influence attainment through first-grade.

Carter (1984) concluded that in order to improve the education of at risk children a number of educationally salient factors must be altered. This study indicates that many of these factors are indeed within the reach of families and schools. These variables constitute some of the focal points for enhancing school success of low income children.

Some final results are briefly noted. Although PREK and peers had negligible direct effects on first-grade outcomes, their indirect effects did not. This puts the effects of these variables in a new light. Often, variables are discounted if they don't have significant direct effects. However, in studying the schooling process indirect and mediating effects are crucial for understanding the dynamic nature of learning and attainment. In addition, the effects of SES were indirect and positive, providing further evidence that its influence is mediated by social psychological variables (Walberg & Marjoribanks, 1976). Of further interest was the advantage of estimating the model with

LISREL. Because of substantial correlations between errors across equations, OLS estimation of the model was inappropriate (Hibbs, 1974; Kessler & Greenberg, 1981).[3] As a result, previous research using OLS in this area should be interpreted cautiously.

Limitations

Some limitations are apparent in the study. First, the results of this model are limited to urban, low income minority students. Some variables in the model were included specifically for this group (PREK and mobility) and may not apply to other populations. Second, teachers were used to measure some of the variables in which reports from parents and students may have been more revealing (e.g., parent involvement, motivation). For example, given that parent involvement was estimated by teachers rather than self-reported or documented by school records, its accuracy is not entirely known. Research is clearly needed to address the correspondence between perceived and actual contact. Third, although the predictive power of the model was generally good, intervening variables were explained less well (e.g., motivation, peers, parent involvement, mobility). Additional studies exploring some of these variables would be informative. The stability of effects may provide further insights about the early schooling process.

References

Alexander, K. L., & Entwisle, D. R. (1988). Achievement in the first 2 years of school: Patterns and processes. Monographs of the Society for Research in Child Development, 53(2, Serial No. 218).

Alwin, D. F., & Thornton, A. (1984). Family origins and the schooling process: Early versus late influence of parental characteristics. American Sociological Review, 49, 784-802.

Bentler, P. M. (1980). Multivariate analysis with latent variables. Annual Review of Psychology, 31, 419-456.

Berrueta-Clement, J. R., Schweinhart, L. T., Barnett, W. S., Epstein, A. S., & Weikert, D. P. (1985). Changed lives: The effects of the Perry preschool program on youths through age 19. Ypsilanti, MI: High/Scope Educational Research Foundation.

Blau, Z. M. (1981). Black children/white children: Competence, socialization, and social structure. New York: Free Press.

Bloom, B. S. (1976). Human characteristics and school learning. New York: McGraw-Hill.

Bronfenbrenner, U. (1975). Is early intervention effective? In M. Guttentag & E. Struening (Eds.), Handbook of evaluation research (Vol. 2, pp. 519-603). Beverly Hills: Sage.

Carroll, J. B. (1963). A model of school learning. Teachers College Record, 64, 723-733.

Carter, L. F. (1984). The sustaining effects study of compensatory and elementary education. Educational Researcher, 13, 4-13.

Chicago Public Schools. (1987a). Chapter 2 All-day kindergarten program final evaluation report, fiscal 1986. Chicago: Department of Research and Evaluation: Author.

Chicago Public Schools. (1987b). 1985-1986 test scores and selected school characteristics. Elementary schools. Chicago: Department of Research and Evaluation: Author.

Clark, R. M. (1983). Family life and school achievement: Why poor black children succeed or fail. Chicago: University of Chicago Press.

Cline, M. G., Endahl, J. R., & McBee, J. K. (1980). Secondary analysis of the data from the evaluation of the transition of head start children into public schools. Blacksburg, VA: Virginia Polytechnic Institute, College of Education (ERIC Document Reproduction Service No. ED 206 380).

Comer, J. P. (1988). Educating poor minority children. Scientific American, 259(5), 42-48.

Cooley, W. W., & Lohnes, P. R. (1976). Evaluation research in education. New York: Irvington.

Cooper, H., & Tom, D. Y. H. (1984). Socioeconomic status and ethnic group differences in achievement motivation. In R. Ames & C. Ames (Eds.), Research on motivation in education. Vol. 1. Student motivation (pp. 209-242). Orlando, FA: Academic Press.

Cuttance, P. (1987). Issues and problems in the application

of structural equation models. In P. Cuttance & R. Ecob (Eds.), Structural equation modeling by example (pp. 241-279). Cambridge, England: Cambridge University Press.

Entwisle, D. R., & Alexander, K. L. (1988). Factors affecting achievement test scores and marks of black and white first graders. Elementary School Journal, 88, 449-471.

Entwisle, D. R., Alexander, K. L., Cadigan, D., & Pallas, A. M. (1987). Kindergarten experience: Cognitive effects of socialization? American Educational Research Journal, 24, 337-364.

Entwisle, D. R., & Hayduk, L. A. (1982). Early schooling: Cognitive and affective outcomes. Baltimore: Johns Hopkins University Press.

Entwisle, D. R., & Hayduk, L. A. (1988). Lasting effects of elementary school. Sociology of Education, 61, 147-159.

Haertel, G. D., Walberg, H. J., & Weinstein, T. (1983). Psychological models of educational performance: A theoretical synthesis of constructs. Review of Educational Research, 53, 75-92.

Haller, A. O. (1982). Social psychological aspects of schooling and achievement. In R. Haller, D. Mechanic, A. Haller, & T. Hauser (Eds.), Social structure and behavior (pp. 3-28). New York: Academic Press, 3-28.

Hannon, M. T., & Young, A. A. (1977). Estimation in panel models: Results on pooling cross-sections and time series. In H. L. Costner (Ed.), Sociology Methodology (pp. 52-83). San Francisco: Jossey-Bass.

Hertel, B. R. (1976). Minimizing error variance introduced by missing data routines in survey analysis. Sociological Methods and Research, 4, 459-474.

Hibbs, D. A. (1974). Problems of statistical estimation and causal inference in time-series regression models. In H. L. Costner (Ed.), Sociological Methodology (pp. 252-308). San Francisco: Jossey-Bass.

Hieronymus, A. N., Lindquist, E. F., & Hoover, H. D. (1980a). Iowa Tests of Basic Skills: Early primary battery. Iowa City, IA: Houghton Mifflin Company.

Hieronymus, A. N., Lindquist, E. F., & Hoover, H. D. (1980b). Iowa Tests of Basic Skills: Primary battery. Iowa City, IA: Houghton Mifflin Company.

Hoffman, L. W. (1984). Work, family, and the socialization of the child. In R. Parke (Ed.), Review of Child Development Research: Vol. 7 (pp. 223-282). Chicago: University of Chicago Press.

Iverson, B. K., Brownlee, G. D., & Walberg, H. J. (1981). Parent-teacher contacts and student learning. Journal of Educational Research, 74, 394-396.

Joreskog, K. G., & Sorbom, D. (1988). LISREL VII: A guide to the program and applications. Chicago: SPSS, Inc.

Joreskog, K. G., & Sorbom, D. (1986). PRELIS: A program for multivariate data screening and data summarization. A preprocessor for LISREL. Mooresville, IN: Scientific Software, Inc.

Keeves, J. P. (1986). Motivation and school learning. In J. P. Keeves (Ed.), International Journal of Educational Research, 10, 117-127.

Keith, T. Z., Reimers, T. M., Fehrmann, P. G., Pottebaum, S. M., & Aubey, L. W. (1986). Parental involvement, homework, and TV time: Direct and indirect effects on high school achievement. Journal of Educational Psychology, 78, 378-380.

Kellam, S. G., Branch, J. D., Agrawal, K. C., & Ensminger, M. E. (1975). Mental health and going to school: The woodlawn program of assessment, early intervention, and evaluation. Chicago: University of Chicago Press.

Kenny, D. A. (1979). Correlation and causality. New York: Wiley.

Kerckhoff, A. C. (1976). Socialization and social class. Englewood Cliffs, NJ: Prentice-Hall.

Kessler, R. C., & Greenberg, D. F. (1981). Linear panel analysis: Models of quantitative change. New York: Academic Press.

Laosa, L. M. (1982). School, occupation, culture, and family: The impact of parental schooling on the parent-child relationship. Journal of Educational Psychology, 74, 791-827.

Lazar, L., & Darlington, R. (1982). Lasting effects of early education: A report from the consortium for longitudinal studies. Monographs of the Society for Research in Child Development, 47 (2/3, Serial No. 195).

Marascuilo, L. A., & Levin, J. R. (1983). Multivariate statistics in the social sciences: A researcher's guide. Monterey, CA: Brooks/Cole Publishing Company.

Marjoribanks, K. (1987). Ability and attitude correlates of academic achievement: Family-group differences. Journal of Educational Psychology, 79, 171-178.

McClelland, D. L. (1976). The achieving society. New York: John Wiley.

Maruyama, G., & Walberg, H. J. (1984). Educational productivity in a social psychological context. In H. Oosthoek and P. van den Eeden (Eds.), Education from the multi-level perspective: Models, methodology and empirical findings (pp. 205-222). New York: Gordon and Breach.

Mercy, J. A., & Steelman, L. C. (1982). Familial influence on the intellectual attainment of children. American Sociological Review, 47, 532-542.

Orfield, G. (1988). Race, income, and educational equality: Students and schools at risk in the 1980s. In School success for students at risk (pp. 45-71). Orlando, FA: Harcourt, Brace, Jovanovich, Publishers.

Rogosa, D. (1979). Causal models in longitudinal research: Rationale, formulation, and interpretation. In J. R. Nesselroade and P. B. Baltes (Eds.), Longitudinal research in the study of behavior and development (pp. 263-302). New York: Academic Press.

Stallings, J. A., & Kaskowitz, D. H. (1974). Follow through classroom observation evaluation 1972-1973. Menlo Park, CA: Stanford Research Institute.

Stevenson, D. L., & Baker, D. P. (1987). The family-school relation and the child's school performance. Child Development, 58, 1348-1357.

Stipek, D. J. (1984). The development of achievement motivation. In R. Ames & C. Ames (Eds.), Research on motivation in education. Vol. 1. Student motivation (pp. 145-174). Orlando, FA: Academic Press.

Tizard, B., Blatchford, P., Burke, J., Farquhar, C., & Plewis, I. (1988). Young children at school in the inner city. Hillsdale, NJ: Lawrence Erlbaum Associates.

Valencia, R. R., Henderson, R. W., & Rankin, R. J. (1985). Family status, family constellation, and home environmental variables as predictors of cognitive performance of mexican american children. Journal of Educational Psychology, 77, 323-331.

Walberg, H. J. (1984). Improving the productivity of american schools. Educational Leadership, 41, 19-27.

Walberg, H. J. (1986). Synthesis of research on teaching. In M. Wittrock (Ed.), Handbook of research on teaching (pp. 214-229). Washington, D. C.: American Educational Research Association.

Walberg, H. J., & Marjoribanks, K. (1976). Family environment and cognitive development: Twelve analytic models. Review of Educational Research, 46, 527-551.

White, K. R. (1985-1986). Efficacy of early intervention. Journal of Special Education, 19, 401-416.

Footnotes

[1]Because of a moderate amount of missing data the pairwise matrix is based on a partial imputation strategy using subgroup means (type of kindergarten program) for children missing on 2 or fewer variables. Approximately 600 cases were imputed on at least one but no more than two variables. The resulting matrix had a similar pattern to the original pairwise matrix. To correct for restricted and arbitrary values of the dichotomous and ordinal variables, the recommended LISREL preprocessing program (PRELIS) was used to generate corresponding polychoric and polyserial correlation estimates (Joreskog and Sorbom, 1984). This matrix, including means and standard deviations, is available upon request.

[2]The primary method of fitting the model was allowing prediction errors within each block to freely correlate as well as allowing errors to correlate among lagged achievement variables (e.g., READ-K and READ-1, MATH-K and MATH-1). In addition, the following paths were deleted because of near-zero t-values: PREK with mobility, READ-1, MATH-1, and SEMAT-1; peer with parent involvement; sex with peer, READ-K, MATH-K, and mobility; SES with READ-1, MATH-1, and SEMAT-1. These deletions were consistent with theoretical expectations. Analysis of the covariance matrix produced identical results.

[3]OLS estimation inflated the amounts of variance explained in the model and seriously biased beta parameter estimates. In addition, the fit of the model was poor without correcting for autocorrelation among equations.

Table 1

Summary of Variables with Significant Indirect Effects on First-Grade Outcomes

Variable	Reading Achievement			Math Achievement			Socio-Emotional Maturity		
	D	I	T	D	I	T	D	I	T
ENTER-K	.170	.316	.486	.162	.287	.449	.110	.208	.318
Gender	.101	.034	.135	.048	.036	.084	.224	.039	.263
SES	-	.098	.098	-	.095	.095	-	.084	.084
PREK	-	.064	.064	-	.050	.050	-	.052	.052
Motivation	-	.178	.239	.142	.124	.266	.146	.094	.240
Peer	-	.094	.094	-	.095	.097	-	.057	.057
READ-K	.472	-	.497	-	-	-	.085	.041	.126

Note. All coefficients are standardized; T > 3.0. (D = Direct effect; I = Indirect effect; T = Total effect). (ENTER-K = entering kindergarten cognitive readiness; SES = socioeconomic status; sex[1 = boys, 2 = girls]; PREK = prekindergarten experience[0 = no, 1 = yes]; peer = peer influence; READ-K = kindergarten reading achievement). Blanks indicate nonsignificance.

Figure Caption

Figure 1. A model of first-grade outcomes (ENTER-K = entering kindergarten cognitive readiness; SES = socioeconomic status; sex[1 = boys, 2 = girls]; PREK = prekindergarten experience[0 = no, 1 = yes]; peer = peer influence; READ-K = kindergarten reading achievement; MATH-K = kindergarten math achievement; mobility[0 = stay, 1 = leave]; READ-1 = first-grade reading achievement; MATH-1 = first-grade math achievement; SEMAT-1 = first-grade socio-emotional maturity).
Note. READ-K does not predict MATH-1 nor does MATH-K predict READ-1.

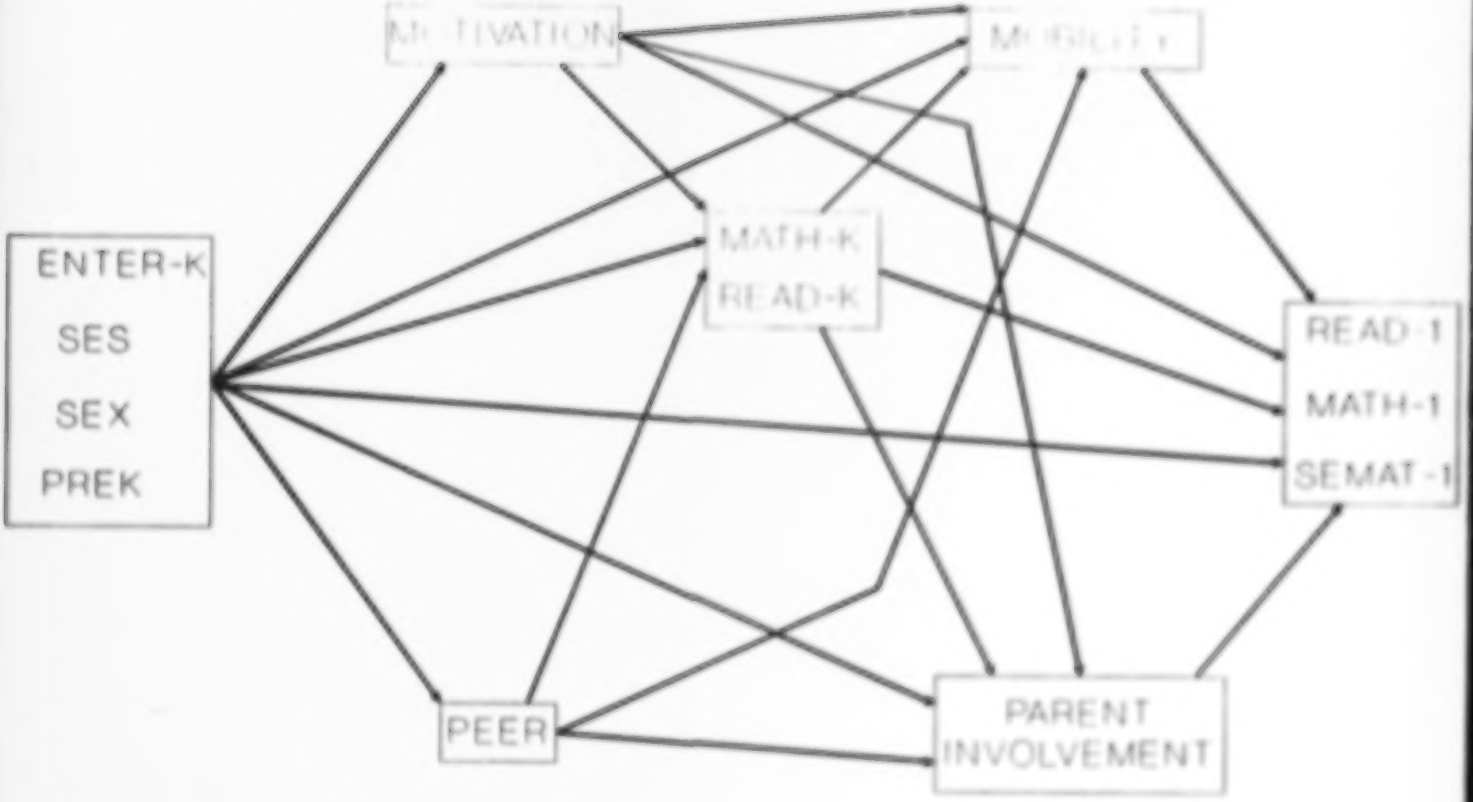

MOTIVATION
MOBILITY
ENTER-K
SES
SEX
PREK
MATH-K
READ-K
READ-1
MATH-1
SEMAT-1
PEER
PARENT
INVOLVEMENT

Figure Caption

Figure 2. Influences on reading achievement: (Effects are standardized regression coefficients; $|t| > 2.5$). (ENTER-K = entering kindergarten cognitive readiness; SES = socioeconomic status; sex[1 = boys, 2 = girls]; PREK = prekindergarten experience[0 = no, 1 = yes]; peer = peer influence; READ-K = kindergarten reading achievement; mobility[0 = stay, 1 = leave]; READ-1 = first-grade reading achievement).

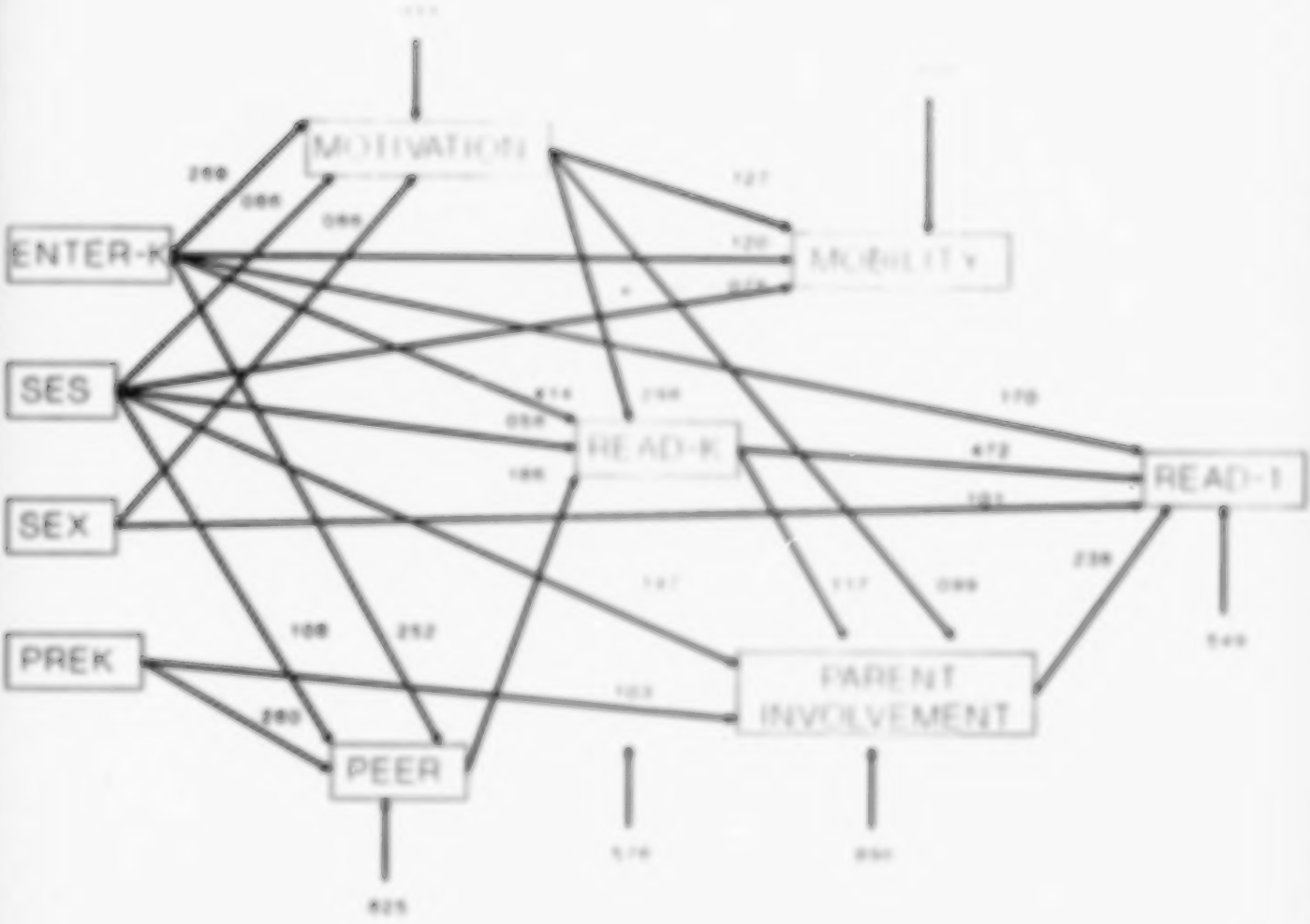

MOTIVATION
ENTER-K
MOBILITY
SES
READ-K
READ-1
SEX
PREK
PARENT
INVOLVEMENT
PEER

Figure Caption

Figure 1. Influences on math achievement: (Effects are standardized regression coefficients; $|t| > 2.5$). (ENTER-K = entering kindergarten cognitive readiness; SES = socioeconomic status; sex[1 = boys, 2 = girls]; PREK = prekindergarten experience[0 = no, 1 = yes]; peer = peer influence; MATH-K = kindergarten math achievement; mobility[0 = stay, 1 = leave]; MATH-1 = first-grade math achievement).

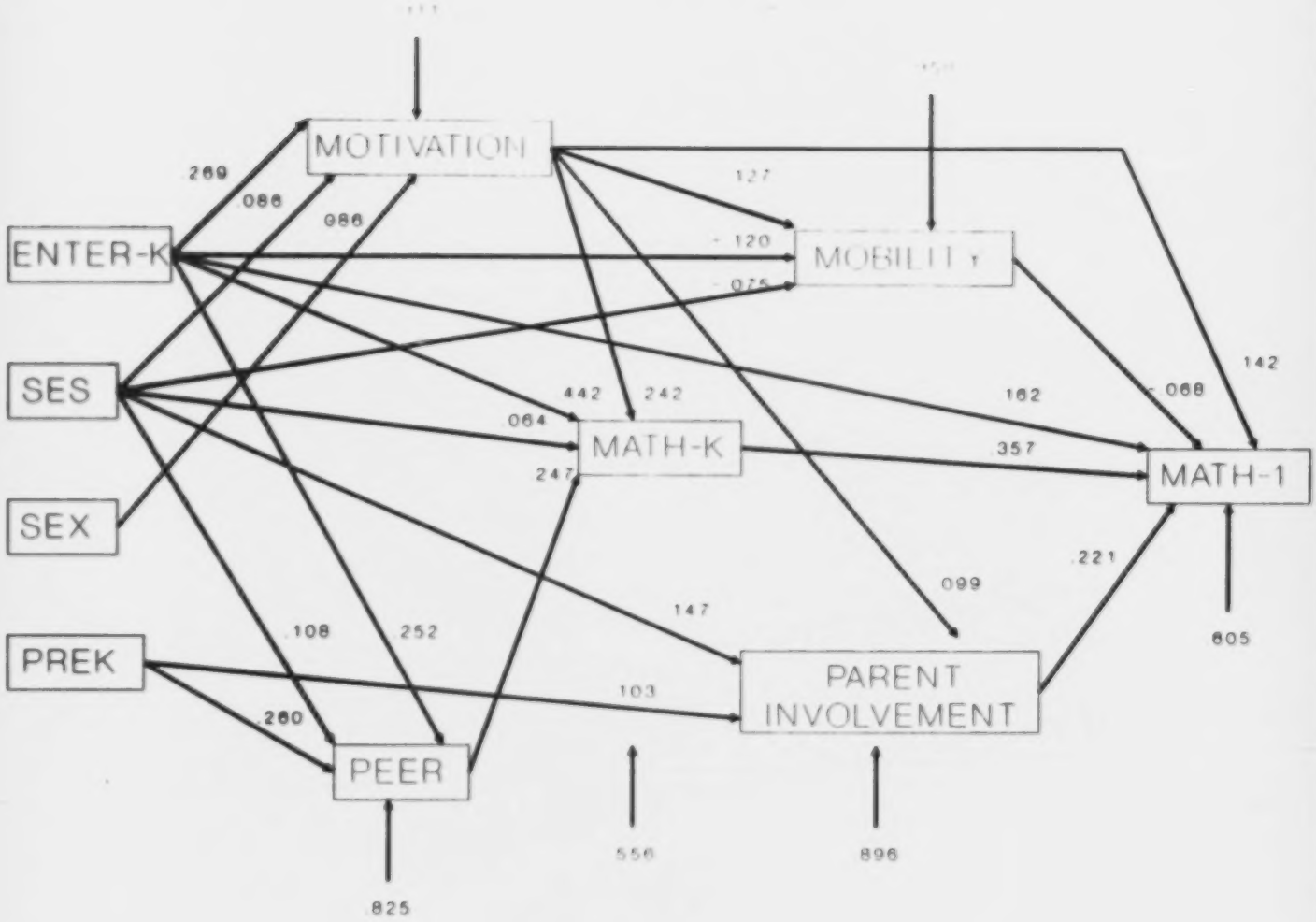
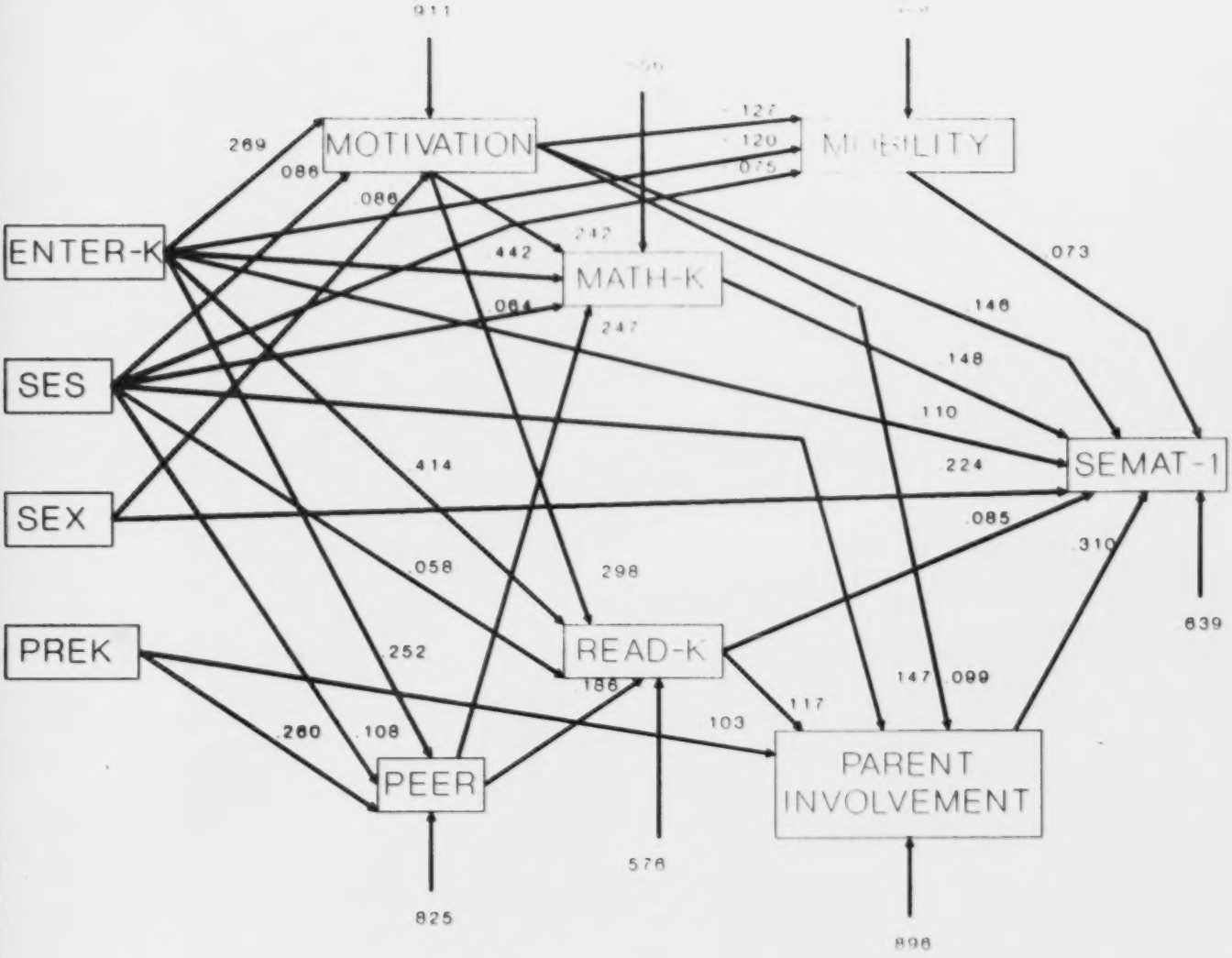

MOTIVATION
ENTER-K
SES
SEX
PREK
PEER
MOBILITY
MATH-K
MATH-1
PARENT INVOLVEMENT
269
086
086
127
120
075
142
068
162
442
242
064
247
357
147
099
221
108
252
103
260
605
556
896
825

Figure Caption

Figure 4. Influences on socio-emotional maturity: (Effects are standardized regression coefficients; T > 2.5). (ENTER-K = entering kindergarten cognitive readiness; SES = socioeconomic status; sex[1 = boys, 2 = girls]; PREK = prekindergarten experience[0 = no, 1 = yes]; peer = peer influence; READ-K = kindergarten reading achievement; MATH-K = kindergarten math achievement; mobility[0 = stay, 1 = leave]; SEMAT-1 = first-grade socio-emotional maturity).


911
MOTIVATION
MOBILITY
ENTER-K
SES
SEX
PREK
MATH-K
READ-K
PEER
PARENT INVOLVEMENT
SEMAT-1
269
086
086
127
120
075
442
242
084
247
073
146
148
110
414
224
085
310
058
298
252
186
147
099
117
103
260
108
639
576
825
896